

We claim:

1. A method of making a crosslinked polymer comprising the steps of:
 - a) providing a highly fluorinated fluoropolymer comprising pendent groups which include a group according to the formula $-SO_2X$, where X is F, Cl, Br, OH or $-O-M^+$, where M^+ is a monovalent cation; and
 - b) exposing said fluoropolymer to electron beam radiation so as to result in the formation of crosslinks.
2. The method according to claim 1 wherein said method additionally comprises, prior to said step b), the step of:
 - c) forming said fluoropolymer into a membrane.
3. The method according to claim 2 wherein said membrane has a thickness of 90 microns or less.
4. The method according to claim 1 wherein said step of exposing said fluoropolymer to electron beam radiation comprises exposing said fluoropolymer to greater than 4 Mrad of electron beam radiation.
5. The method according to claim 1 wherein said highly fluorinated fluoropolymer is perfluorinated.
6. The method according to claim 1 wherein said pendent groups are according to the formula $-R^1-SO_2X$, where R^1 is a branched or unbranched perfluoroalkyl or perfluoroether group comprising 1-15 carbon atoms and 0-4 oxygen atoms, and where X is F, Cl, Br, OH or $-O-M^+$, where M^+ is a monovalent cation.

7. The method according to claim 1 wherein said pendent groups are groups according to the formula $-\text{O}-(\text{CF}_2)_4-\text{SO}_2\text{X}$, where X is F, Cl, Br, OH or $-\text{O}^-\text{M}^+$, where M^+ is a monovalent cation.
- 5 8. The method according to claim 7 wherein X is OH.
9. The method according to claim 2 wherein said pendent groups are according to the formula $-\text{R}^1-\text{SO}_2\text{X}$, where R^1 is a branched or unbranched perfluoroalkyl or perfluoroether group comprising 1-15 carbon atoms and 0-4 oxygen atoms, and where
- 10 X is F, Cl, Br, OH or $-\text{O}^-\text{M}^+$, where M^+ is a monovalent cation.
10. The method according to claim 2 wherein said pendent groups are groups according to the formula $-\text{O}-(\text{CF}_2)_4-\text{SO}_2\text{X}$, where X is F, Cl, Br, OH or $-\text{O}^-\text{M}^+$, where M^+ is a monovalent cation.
- 15 11. The method according to claim 10 wherein X is OH.
12. The method according to claim 3 wherein said pendent groups are according to the formula $-\text{R}^1-\text{SO}_2\text{X}$, where R^1 is a branched or unbranched perfluoroalkyl or
- 20 perfluoroether group comprising 1-15 carbon atoms and 0-4 oxygen atoms, and where X is F, Cl, Br, OH or $-\text{O}^-\text{M}^+$, where M^+ is a monovalent cation.
13. The method according to claim 3 wherein said pendent groups are groups according to the formula $-\text{O}-(\text{CF}_2)_4-\text{SO}_2\text{X}$, where X is F, Cl, Br, OH or $-\text{O}^-\text{M}^+$, where
- 25 M^+ is a monovalent cation.
14. The method according to claim 13 wherein X is OH.

15. The method according to claim 4 wherein said pendent groups are according to the formula $-R^1-SO_2X$, where R^1 is a branched or unbranched perfluoroalkyl or perfluoroether group comprising 1-15 carbon atoms and 0-4 oxygen atoms, and where X is F, Cl, Br, OH or $-O-M^+$, where M^+ is a monovalent cation.

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16. The method according to claim 4 wherein said pendent groups are groups according to the formula $-O-(CF_2)_4-SO_2X$, where X is F, Cl, Br, OH or $-O-M^+$, where M^+ is a monovalent cation.

10 17. The method according to claim 16 wherein X is OH.

18. The method according to claim 1 wherein step c) comprises imbibing said fluoropolymer into a porous supporting matrix.

15 19. The method according to claim 18 wherein said porous supporting matrix is a porous polytetrafluoroethylene web.

20. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 1.

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21. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 2.

22. A polymer electrolyte membrane comprising the crosslinked polymer made
25 according to the method of claim 3.

23. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 4.

24. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 5.

25. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 6.

26. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 7.

27. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 8.

28. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 9.

29. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 10.

30. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 11.

31. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 12.

32. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 13.

33. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 14.

34. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 15.

5 35. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 16.

36. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 17.

10 37. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 18.

38. A polymer electrolyte membrane comprising the crosslinked polymer made according to the method of claim 19.

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